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SEQUENCE LISTING

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<120> Proton Transporters And Uses In Plants

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<160> 5

<170> FastSEQ for Windows Version 4.0

<210> 1

<211> 538

<212> PRT

<213> Artificial Sequence

<220>

<223> Arabidopsis - AtNhx1

<400> 1

Met	Leu	Asp	Ser	Leu	Val	Ser	Lys	Leu	Pro	Ser	Leu	Ser	Thr	Ser	Asp
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His	Ala	Ser	Val	Val	Ala	Leu	Asn	Leu	Phe	Val	Ala	Leu	Leu	Cys	Ala
			20					25					30		
Cys	Ile	Val	Leu	Gly	His	Leu	Leu	Glu	Glu	Asn	Arg	Trp	Met	Asn	Glu
		35					40					45			
Ser	Ile	Thr	Ala	Leu	Leu	Ile	Gly	Leu	Gly	Thr	Gly	Val	Thr	Ile	Leu
		50				55					60				
Leu	Ile	Ser	Lys	Gly	Lys	Ser	Ser	His	Leu	Leu	Val	Phe	Ser	Glu	Asp
65					70					75				80	
Leu	Phe	Phe	Ile	Tyr	Leu	Leu	Pro	Pro	Ile	Ile	Phe	Asn	Ala	Gly	Phe
			85					90					95		
Gln	Val	Lys	Lys	Lys	Gln	Phe	Phe	Arg	Asn	Phe	Val	Thr	Ile	Met	Leu
			100					105					110		
Phe	Gly	Ala	Val	Gly	Thr	Ile	Ile	Ser	Cys	Thr	Ile	Ile	Ser	Leu	Gly
		115					120					125			
Val	Thr	Gln	Phe	Phe	Lys	Lys	Leu	Asp	Ile	Gly	Thr	Phe	Asp	Leu	Gly
		130				135					140				
Asp	Tyr	Leu	Ala	Ile	Gly	Ala	Ile	Phe	Ala	Ala	Thr	Asp	Ser	Val	Cys
145					150					155				160	
Thr	Leu	Gln	Val	Leu	Asn	Gln	Asp	Glu	Thr	Pro	Leu	Leu	Tyr	Ser	Leu
					165				170					175	
Val	Phe	Gly	Glu	Gly	Val	Val	Asn	Asp	Ala	Thr	Ser	Val	Val	Val	Phe
			180					185						190	

```

Asn Ala Ile Gln Ser Phe Asp Leu Thr His Leu Asn His Glu Ala Ala
    195                200                205
Phe His Leu Leu Gly Asn Phe Leu Tyr Leu Phe Leu Leu Ser Thr Leu
    210                215                220
Leu Gly Ala Ala Thr Gly Leu Ile Ser Ala Tyr Val Ile Lys Lys Leu
    225                230                235                240
Tyr Phe Gly Arg His Ser Thr Asp Arg Glu Val Ala Leu Met Met Leu
                245                250                255
Met Ala Tyr Leu Ser Tyr Met Leu Ala Glu Leu Phe Asp Leu Ser Gly
                260                265                270
Ile Leu Thr Val Phe Phe Cys Gly Ile Val Met Ser His Tyr Thr Trp
    275                280                285
His Asn Val Thr Glu Ser Ser Arg Ile Thr Thr Lys His Thr Phe Ala
    290                295                300
Thr Leu Ser Phe Leu Ala Glu Thr Phe Ile Phe Leu Tyr Val Gly Met
    305                310                315                320
Asp Ala Leu Asp Ile Asp Lys Trp Arg Ser Val Ser Asp Thr Pro Gly
                325                330                335
Thr Ser Ile Ala Val Ser Ser Ile Leu Met Gly Leu Val Met Val Gly
    340                345                350
Arg Ala Ala Phe Val Phe Pro Leu Ser Phe Leu Ser Asn Leu Ala Lys
    355                360                365
Lys Asn Gln Ser Glu Lys Ile Asn Phe Asn Met Gln Val Val Ile Trp
    370                375                380
Trp Ser Gly Leu Met Arg Gly Ala Val Ser Met Ala Leu Ala Tyr Asn
    385                390                395                400
Lys Phe Thr Arg Ala Gly His Thr Asp Val Arg Gly Asn Ala Ile Met
                405                410                415
Ile Thr Ser Thr Ile Thr Val Cys Leu Phe Ser Thr Val Val Phe Gly
    420                425                430
Met Leu Thr Lys Pro Leu Ile Ser Tyr Leu Leu Pro His Gln Asn Ala
    435                440                445
Thr Thr Ser Met Leu Ser Asp Asp Asn Thr Pro Lys Ser Ile His Ile
    450                455                460
Pro Leu Leu Asp Gln Asp Ser Phe Ile Glu Pro Ser Gly Asn His Asn
    465                470                475                480
Val Pro Arg Pro Asp Ser Ile Arg Gly Phe Leu Thr Arg Pro Thr Arg
                485                490                495
Thr Val His Tyr Tyr Trp Arg Gln Phe Asp Asp Ser Phe Met Arg Pro
    500                505                510
Val Phe Gly Gly Arg Gly Phe Val Pro Phe Val Pro Gly Ser Pro Thr
    515                520                525
Glu Arg Asn Pro Pro Asp Leu Ser Lys Ala
    530                535

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<210> 2

<211> 669

<212> PRT

<213> Artificial Sequence

<220>

<223> Human - HsNhe-6

<400> 2

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Met Ala Arg Arg Gly Trp Arg Arg Ala Pro Leu Arg Arg Gly Val Gly
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Ser Ser Pro Arg Ala Arg Arg Leu Met Arg Pro Leu Trp Leu Leu Leu
    20              25              30

```

Ala	Val	Gly	Val	Phe	Asp	Trp	Ala	Gly	Ala	Ser	Asp	Gly	Gly	Gly	Gly
		35					40					45			
Glu	Ala	Arg	Ala	Met	Asp	Glu	Glu	Ile	Val	Ser	Glu	Lys	Gln	Ala	Glu
		50				55					60				
Glu	Ser	His	Arg	Gln	Asp	Ser	Ala	Asn	Leu	Leu	Ile	Phe	Ile	Leu	Leu
65					70					75					80
Leu	Thr	Leu	Thr	Ile	Leu	Thr	Ile	Trp	Leu	Phe	Lys	His	Arg	Arg	Ala
				85					90					95	
Arg	Phe	Leu	His	Glu	Thr	Gly	Leu	Ala	Met	Ile	Tyr	Gly	Leu	Leu	Val
			100					105					110		
Gly	Leu	Val	Leu	His	Tyr	Gly	Ile	His	Val	Pro	Ser	Asp	Val	Asn	Asn
		115					120					125			
Val	Thr	Leu	Ser	Cys	Glu	Val	Gln	Ser	Ser	Pro	Thr	Thr	Leu	Leu	Val
130						135					140				
Thr	Phe	Asp	Pro	Glu	Val	Phe	Phe	Asn	Ile	Leu	Leu	Pro	Pro	Ile	Ile
145					150					155					160
Phe	Tyr	Ala	Gly	Tyr	Ser	Leu	Lys	Arg	Arg	His	Phe	Phe	Arg	Asn	Leu
				165					170					175	
Gly	Ser	Ile	Leu	Ala	Tyr	Ala	Phe	Leu	Gly	Thr	Ala	Ile	Ser	Cys	Phe
			180					185					190		
Val	Ile	Gly	Ser	Ile	Met	Tyr	Gly	Gly	Val	Thr	Leu	Met	Lys	Val	Thr
		195					200					205			
Gly	Gln	Leu	Ala	Gly	Asp	Phe	Tyr	Phe	Thr	Asp	Cys	Leu	Leu	Phe	Gly
		210				215					220				
Ala	Ile	Val	Ser	Ala	Thr	Asp	Pro	Val	Thr	Val	Leu	Ala	Ile	Phe	His
225					230					235					240
Glu	Leu	Gln	Val	Asp	Val	Glu	Leu	Tyr	Ala	Leu	Leu	Phe	Gly	Glu	Ser
				245					250					255	
Val	Leu	Asn	Asp	Ala	Val	Ala	Ile	Val	Leu	Ser	Ser	Ser	Ile	Val	Ala
			260					265					270		
Tyr	Gln	Pro	Ala	Gly	Asp	Asn	Ser	His	Thr	Phe	Asp	Val	Thr	Ala	Met
		275					280					285			
Phe	Lys	Ser	Ile	Gly	Ile	Phe	Leu	Gly	Ile	Phe	Ser	Gly	Ser	Phe	Ala
		290				295					300				
Met	Gly	Ala	Ala	Thr	Gly	Val	Val	Thr	Ala	Leu	Val	Thr	Lys	Phe	Thr
305					310					315					320
Lys	Leu	Arg	Glu	Phe	Gln	Leu	Leu	Glu	Thr	Gly	Leu	Phe	Phe	Leu	Met
				325					330					335	
Ser	Trp	Ser	Thr	Phe	Leu	Leu	Ala	Glu	Ala	Trp	Gly	Phe	Thr	Gly	Val
			340						345					350	
Val	Ala	Val	Leu	Phe	Cys	Gly	Ile	Thr	Gln	Ala	His	Tyr	Thr	Tyr	Asn
			355				360					365			
Asn	Leu	Ser	Thr	Glu	Ser	Gln	His	Arg	Thr	Lys	Gln	Leu	Phe	Glu	Leu
						375					380				
Leu	Asn	Phe	Leu	Ala	Glu	Asn	Phe	Ile	Phe	Ser	Tyr	Met	Gly	Leu	Thr
385					390					395					400
Leu	Phe	Thr	Phe	Gln	Asn	His	Val	Phe	Asn	Pro	Thr	Phe	Val	Val	Gly
				405					410					415	
Ala	Phe	Val	Ala	Ile	Phe	Leu	Gly	Arg	Ala	Ala	Asn	Ile	Tyr	Pro	Leu
				420				425					430		
Ser	Leu	Leu	Leu	Asn	Leu	Gly	Arg	Arg	Ser	Lys	Ile	Gly	Ser	Asn	Phe
				435			440					445			
Gln	His	Met	Met	Met	Phe	Ala	Gly	Leu	Arg	Gly	Ala	Met	Ala	Phe	Ala
		450				455					460				
Leu	Ala	Ile	Arg	Asp	Thr	Ala	Thr	Tyr	Ala	Arg	Gln	Met	Met	Phe	Ser
465					470					475					480
Thr	Thr	Leu	Leu	Ile	Val	Phe	Phe	Thr	Val	Trp	Val	Phe	Gly	Gly	Gly
				485					490					495	

```

Thr Thr Ala Met Leu Ser Cys Leu His Ile Arg Val Gly Val Asp Ser
      500                      505                      510
Asp Gln Glu His Leu Gly Val Pro Glu Asn Glu Arg Arg Thr Thr Lys
      515                      520                      525
Ala Glu Ser Ala Trp Leu Phe Arg Met Trp Tyr Asn Phe Asp His Asn
      530                      535                      540
Tyr Leu Lys Pro Leu Leu Thr His Ser Gly Pro Pro Leu Thr Thr Thr
545                      550                      555                      560
Leu Pro Ala Cys Cys Gly Pro Ile Ala Arg Cys Leu Thr Ser Pro Gln
      565                      570                      575
Ala Tyr Glu Asn Gln Glu Gln Leu Lys Asp Asp Asp Ser Asp Leu Ile
      580                      585                      590
Leu Asn Asp Gly Asp Ile Ser Leu Thr Tyr Gly Asp Ser Thr Val Asn
      595                      600                      605
Thr Glu Pro Ala Thr Ser Ser Ala Pro Arg Arg Phe Met Gly Asn Ser
      610                      615                      620
Ser Glu Asp Ala Leu Asp Arg Glu Leu Ala Phe Gly Asp His Glu Leu
625                      630                      635                      640
Val Ile Arg Gly Thr Arg Leu Val Leu Pro Met Asp Asp Ser Glu Pro
      645                      650                      655
Pro Leu Asn Leu Leu Asp Asn Thr Arg His Gly Pro Ala
      660                      665

```

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<210> 3
<211> 633
<212> PRT
<213> Artificial Sequence

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<220>
<223> Yeast - ScNhx1

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<400> 3
Met Leu Ser Lys Val Leu Leu Asn Ile Ala Phe Lys Val Leu Leu Thr
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      20      25      30
Ser Pro Asp Leu Pro Gly Ser Asp Asp Pro Ile Ala Gly Asp Pro Asp
      35      40      45
Val Asp Leu Asn Pro Val Thr Glu Glu Met Phe Ser Ser Trp Ala Leu
      50      55      60
Phe Ile Met Leu Leu Leu Leu Ile Ser Ala Leu Trp Ser Ser Tyr Tyr
65      70      75      80
Leu Thr Gln Lys Arg Ile Arg Ala Val His Glu Thr Val Leu Ser Ile
      85      90      95
Phe Tyr Gly Met Val Ile Gly Leu Ile Ile Arg Met Ser Pro Gly His
      100     105     110
Tyr Ile Gln Asp Thr Val Thr Phe Asn Ser Ser Tyr Phe Phe Asn Val
      115     120     125
Leu Leu Pro Pro Ile Ile Leu Asn Ser Gly Tyr Glu Leu Asn Gln Val
      130     135     140
Asn Phe Phe Asn Asn Met Leu Ser Ile Leu Ile Phe Ala Ile Pro Gly
145     150     155     160
Thr Phe Ile Ser Ala Val Val Ile Gly Ile Ile Leu Tyr Ile Trp Thr
      165     170     175
Phe Leu Gly Leu Glu Ser Ile Asp Ile Ser Phe Ala Asp Ala Met Ser
      180     185     190

```

Val	Gly	Ala	Thr	Leu	Ser	Ala	Thr	Asp	Pro	Val	Thr	Ile	Leu	Ser	Ile
		195					200					205			
Phe	Asn	Ala	Tyr	Lys	Val	Asp	Pro	Lys	Leu	Tyr	Thr	Ile	Ile	Phe	Gly
	210					215				220					
Glu	Ser	Leu	Leu	Asn	Asp	Ala	Ile	Ser	Ile	Val	Met	Phe	Glu	Thr	Cys
225				230						235					240
Gln	Lys	Phe	His	Gly	Gln	Pro	Ala	Thr	Phe	Ser	Ser	Val	Phe	Glu	Gly
			245						250					255	
Ala	Gly	Leu	Phe	Leu	Met	Thr	Phe	Ser	Val	Ser	Leu	Leu	Ile	Gly	Val
			260					265					270		
Leu	Ile	Gly	Ile	Leu	Val	Ala	Leu	Leu	Leu	Lys	His	Thr	His	Ile	Arg
	275					280						285			
Arg	Tyr	Pro	Gln	Ile	Glu	Ser	Cys	Leu	Ile	Leu	Leu	Ile	Ala	Tyr	Glu
	290					295				300					
Ser	Tyr	Phe	Phe	Ser	Asn	Gly	Cys	His	Met	Ser	Gly	Ile	Val	Ser	Leu
305					310					315					320
Leu	Phe	Cys	Gly	Ile	Thr	Leu	Lys	His	Tyr	Ala	Tyr	Tyr	Asn	Met	Ser
				325					330					335	
Arg	Arg	Ser	Gln	Ile	Thr	Ile	Lys	Tyr	Ile	Phe	Gln	Leu	Leu	Ala	Arg
			340					345					350		
Leu	Ser	Glu	Asn	Phe	Ile	Phe	Ile	Tyr	Leu	Gly	Leu	Glu	Leu	Phe	Thr
	355					360						365			
Glu	Val	Glu	Leu	Val	Tyr	Lys	Pro	Leu	Leu	Ile	Ile	Val	Ala	Ala	Ile
	370					375					380				
Ser	Ile	Cys	Val	Ala	Arg	Trp	Cys	Ala	Val	Phe	Pro	Leu	Ser	Gln	Phe
385					390					395					400
Val	Asn	Trp	Ile	Tyr	Arg	Val	Lys	Thr	Ile	Arg	Ser	Met	Ser	Gly	Ile
			405						410					415	
Thr	Gly	Glu	Asn	Ile	Ser	Val	Pro	Asp	Glu	Ile	Pro	Tyr	Asn	Tyr	Gln
			420					425					430		
Met	Met	Thr	Phe	Trp	Ala	Gly	Leu	Arg	Gly	Ala	Val	Gly	Val	Ala	Leu
		435					440					445			
Ala	Leu	Gly	Ile	Gln	Gly	Glu	Tyr	Lys	Phe	Thr	Leu	Leu	Ala	Thr	Val
	450					455						460			
Leu	Val	Val	Val	Val	Leu	Thr	Val	Ile	Ile	Phe	Gly	Gly	Thr	Thr	Ala
465					470					475					480
Gly	Met	Leu	Glu	Val	Leu	Asn	Ile	Lys	Thr	Gly	Cys	Ile	Ser	Glu	Glu
			485						490					495	
Asp	Thr	Ser	Asp	Asp	Glu	Phe	Asp	Ile	Glu	Ala	Pro	Arg	Ala	Ile	Asn
			500					505					510		
Leu	Leu	Asn	Gly	Ser	Ser	Ile	Gln	Thr	Asp	Leu	Gly	Pro	Tyr	Ser	Asp
	515						520					525			
Asn	Asn	Ser	Pro	Asp	Ile	Ser	Ile	Asp	Gln	Phe	Ala	Val	Ser	Ser	Asn
	530					535					540				
Lys	Asn	Leu													

<210> 4
 <211> 11
 <212> PRT
 <213> Unknown

<220>
 <223> Putative Amiloride Binding Site From Human Nhe1

<400> 4
 Asp Val Phe Phe Leu Phe Leu Leu Pro Pro Ile
 1 5 10

<210> 5
 <211> 38
 <212> PRT
 <213> Unknown

<220>
 <223> PCR Primer Used To Amplify AtNhx1 ORF

<400> 5
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 1 5 10 15
 Thr Cys Thr Ala Gly Thr Gly Thr Cys Gly Ala Ala Ala Cys Thr Gly
 20 25 30
 Cys Cys Thr Thr Cys Gly
 35